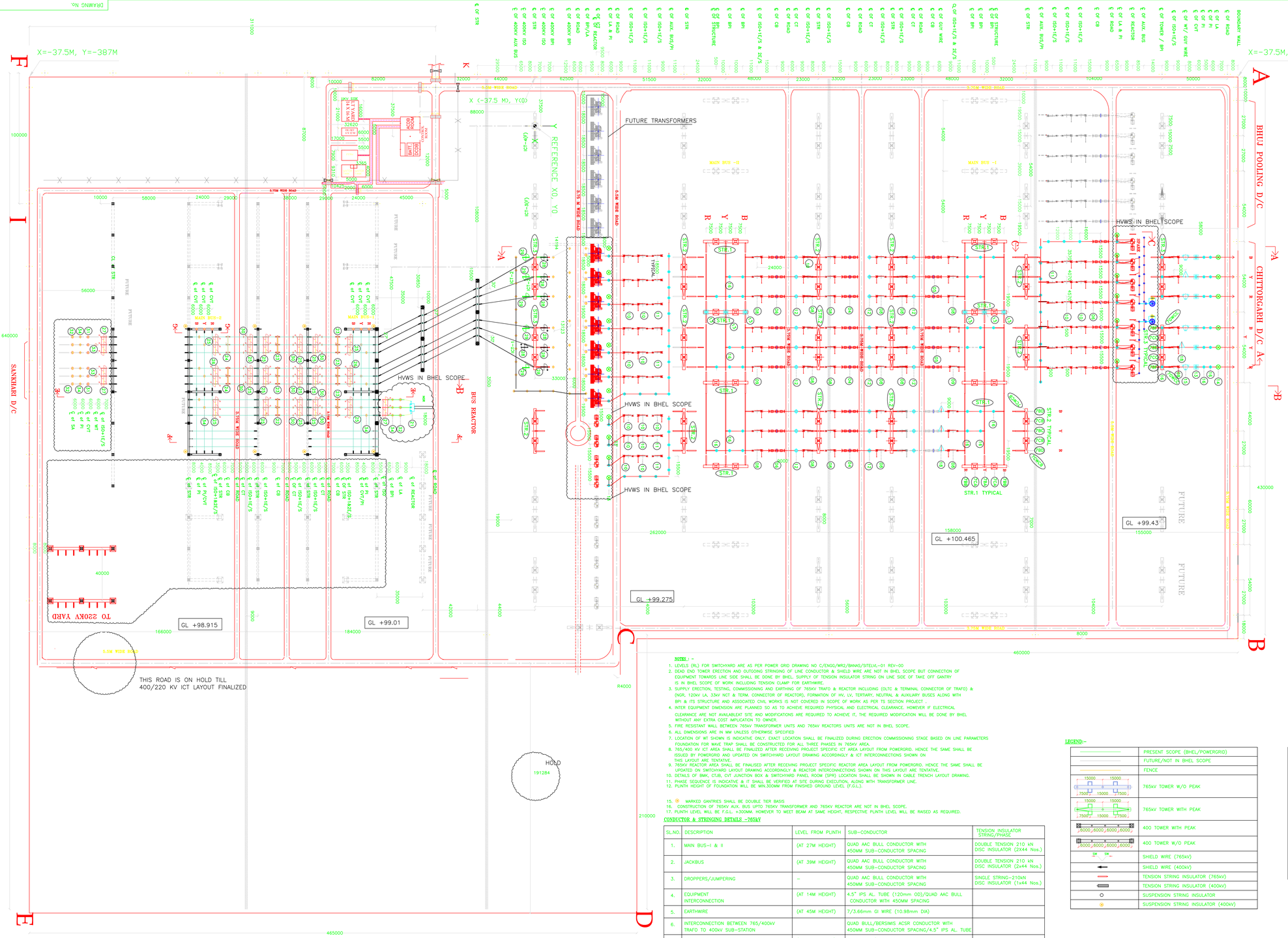


BILL OF QTY. FOR 765kV MAIN EQUIPMENTS (50KA FOR 1 SEC)

ITEM Code	DESCRIPTION	RATING	QTY. (ND) (PART-1)	SYMBOL	SCOPE OF SUPPLY
1	500 MVA, (1-PH) AUTOTRANSFORMER	765/400/33KV	7		PGCIL
2	110MVAR LINE REACTOR (1-PH) WITH NGR(250 Ohm)	765KV	7		PGCIL
3	110MVAR BUS REACTOR (1-PH)	765KV	4		PGCIL
4	SF6 CIRCUIT BREAKER WITH CR, WITH CSD (3-PH)	3150A	3		PGCIL
5	SF6 CIRCUIT BREAKER WITH CR,WITHOUT CSD (3-PH)	3150A	2		PGCIL
6	SF6 CIRCUIT BREAKER WITHOUT CR,WITH CSD (3-PH)	3150A	5		PGCIL
7	SF6 CIRCUIT BREAKER WITHOUT CR,WITH CSD (1-PH)	3150A	1		PGCIL
8	ISOLATOR WITH ONE E/SW (3 PH) VERTICAL KNEE TYPE	3150A	17		BHEL
9	ISOLATOR WITH TWO E/SW (3 PH) VERTICAL KNEE TYPE	3150A	2		BHEL
10	ISOLATOR WITH ONE E/SW (1 PH) VERTICAL KNEE TYPE	2000A	33		BHEL
11	ISOLATOR WITHOUT E/SW (1 PH) VERTICAL KNEE TYPE	2000A	12		BHEL
12	CURRENT TRANSFORMER (1 PH) WITH 120% EXTENDED CURRENT RATING.	3000A	24		BHEL
13	CVT (1 PH)	6800pF	12		BHEL
14	SURGE ARRESTER (1 PH)	624 kV	24		BHEL
15	WAVE TRAP (1 PH) PEDESTAL TYPE.	1mH, 3150A	04		BHEL
16	765KV POST INSULATOR (FOR SWITCHYARD)	624 kV	66		BHEL
17	765KV POST INSULATOR (FOR WAVE TRAP)	624 kV	12		BHEL
18	765KV GUY WIRE (FOR SWITCHYARD)		05		BHEL

BILL OF QTY. FOR 400kV MAIN EQUIPMENTS:(63KA FOR 1 SEC)

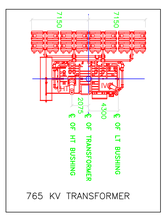
ITEM Code	DESCRIPTION	RATING	QTY. (PART-1)	QTY. (PART-2) (ND) (SY.HLD)	SYMBOL	SCOPE OF SUPPLY
20	500MVA, (3-PH) AUTOTRANSFORMER.	400/220/33KV	0	2		BHEL
21	125MVAR BUS REACTOR (3-PH)	420 kV	1	0		BHEL
22	SF6 CIRCUIT BREAKER WITH CR, WITH CSD (3-PH)	3150A	1	2		BHEL
23	SF6 CIRCUIT BREAKER WITHOUT CR,WITH CSD (3-PH)	3150A	5	2		BHEL
24	SF6 CIRCUIT BREAKER WITHOUT CR,WITHOUT CSD (3-PH)	3150A	2	0		BHEL
25	ISOLATOR WITH ONE E/SW (3 PH) DOUBLE BREAK TYPE	3150A	15	10		BHEL
26	ISOLATOR WITH TWO E/SW (3 PH) DOUBLE BREAK TYPE	3150A	2	0		BHEL
27	ISOLATOR WITH ONE E/SW (3 PH) DOUBLE BREAK TYPE	2000A	3	2		BHEL
28	ISOLATOR WITH ONE E/SW (1 PH) DOUBLE BREAK TYPE	3150A	7	0		BHEL
29	ISOLATOR WITHOUT E/SW (1 PH) DOUBLE BREAK TYPE	3150A	5	0		BHEL
30	CURRENT TRANSFORMER (1 PH) WITH 160% EXTENDED CURRENT RATING.	3000A	24	12		BHEL
31	CVT (1 PH)	4400pF	12	0		BHEL
32	SURGE ARRESTER (1 PH)	336 kV	16	6		BHEL
33	WAVE TRAP (1 PH) PEDESTAL TYPE.	0.5mH, 2000A	2	0		BHEL
34	400KV BPI (FOR SWITCHYARD)	400KV	40			BHEL
35	400KV BPI (FOR WT)	400KV	6			

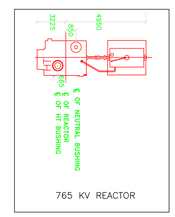
NOTES :-

1. LEVELS (RL) FOR SWITCHYARD ARE AS PER POWER GRID DRAWING NO C/ENGG/WR2/BANAS/SITELVL-01 REV-00
2. DEAD END TOWER ERECTION AND OUTGOING STRINGING OF LINE CONDUCTOR & SHIELD WIRE ARE NOT IN BHEL SCOPE BUT CONNECTION OF EQUIPMENT TOWARDS LINE SIDE SHALL BE DONE BY BHEL. SUPPLY OF TENSION INSULATOR STRING ON LINE SIDE OF TAKE OFF GANTRY IS IN BHEL SCOPE OF WORK INCLUDING TENSION CLAMP FOR EARTHWIRE.
3. SUPPLY, ERECTION, TESTING, COMMISSIONING AND EARTHING OF 765KV TRAFO & REACTOR INCLUDING (OLTC & TERMINAL CONNECTOR OF TRAFO) & (NGR, 120KV LA, 33KV NCT & TERM. CONNECTOR OF REACTOR), FORMATION OF HV, LV, TERTIARY, NEUTRAL & AUXILIARY BUSES ALONG WITH BPI & ITS STRUCTURE AND ASSOCIATED CIVIL WORKS IS NOT COVERED IN SCOPE OF WORK AS PER TS SECTION PROJECT .
4. INTER EQUIPMENT DIMENSION ARE PLANNED SO AS TO ACHIEVE REQUIRED PHYSICAL AND ELECTRICAL CLEARANCE. HOWEVER IF ELECTRICAL CLEARANCE ARE NOT AVAILABLEAT SITE AND MODIFICATIONS ARE REQUIRED TO ACHIEVE IT, THE REQUIRED MODIFICATION WILL BE DONE BY BHEL WITHOUT ANY EXTRA COST IMPLICATION TO OWNER.
5. FIRE RESISTANT WALL BETWEEN 765kV TRANSFORMER UNITS AND 765kV REACTORS UNITS ARE NOT IN BHEL SCOPE.
6. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
7. LOCATION OF WT SHOWN IS INDICATIVE ONLY. EXACT LOCATION SHALL BE FINALIZED DURING ERECTION COMMISSIONING STAGE BASED ON LINE PARAMETERS
8. FOUNDATION FOR WAVE TRAP SHALL BE CONSTRUCTED FOR ALL THREE PHASES IN 765KV AREA.
9. 765/400 KV ICT AREA SHALL BE FINALIZED AFTER RECEIVING PROJECT SPECIFIC ICT AREA LAYOUT FROM POWERGRID. HENCE THE SAME SHALL BE ISSUED BY POWERGRID AND UPDATED ON SWITCHYARD LAYOUT DRAWING ACCORDINGLY & ICT INTERCONNECTIONS SHOWN ON THIS LAYOUT ARE TENTATIVE.
10. 765KV REACTOR AREA SHALL BE FINALISED AFTER RECEIVING PROJECT SPECIFIC REACTOR AREA LAYOUT FROM POWERGRID. HENCE THE SAME SHALL BE UPDATED ON SWITCHYARD LAYOUT DRAWING ACCORDINGLY & REACTOR INTERCONNECTIONS SHOWN ON THIS LAYOUT ARE TENTATIVE.
11. DETAILS OF BMK, CTAB, CVT JUNCTION BOX & SWITCHYARD PANEL ROOM (SPR) LOCATION SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.
12. PHASE SEQUENCE IS INDICATIVE & IT SHALL BE VERIFIED AT SITE DURING EXECUTION, ALONG WITH TRANSFORMER LINE.
13. PLINTH HEIGHT OF FOUNDATION WILL BE MIN.300MM FROM FINISHED GROUND LEVEL (F.G.L.).
14.
15. MARKED GANTRIES SHALL BE DOUBLE TIER BASIS
16. CONSTRUCTION OF 765kV AUX. BUS UPTO 765KV TRANSFORMER AND 765KV REACTOR ARE NOT IN BHEL SCOPE.
17. PLINTH LEVEL WILL BE F.G.L +300MM. HOWEVER TO MEET BEAM AT SAME HEIGHT, RESPECTIVE PLINTH LEVEL WILL BE RAISED AS REQUIRED.

LEGEND:-

	PRESENT SCOPE (BHEL/POWERGRID)
	FUTURE/NOT IN BHEL SCOPE
	FENCE
	765kV TOWER W/O PEAK
	765kV TOWER WITH PEAK
	400 TOWER WITH PEAK
	400 TOWER W/O PEAK
	SHIELD WIRE (765kV)
	SHIELD WIRE (400kV)
	TENSION STRING INSULATOR (765kV)
	TENSION STRING INSULATOR (400kV)
	SUSPENSION STRING INSULATOR
	SUSPENSION STRING INSULATOR (400kV)





CONDUCTOR & STRINGING DETAILS :-765kV

SL.NO.	DESCRIPTION	LEVEL FROM PLINTH	SUB-CONDUCTOR	TENSION INSULATOR STRING/PHASE
1.	MAIN BUS-I & II	(AT 27M HEIGHT)	QUAD AAC BULL CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	DOUBLE TENSION 210 kN DISC INSULATOR (2X44 Nos.)
2.	JACKBUS	(AT 39M HEIGHT)	QUAD AAC BULL CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	DOUBLE TENSION 210 kN DISC INSULATOR (2x44 Nos.)
3.	DROPPERS/JUMPERING	--	QUAD AAC BULL CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	SINGLE STRING-210kN DISC INSULATOR (1x44 Nos.)
4.	EQUIPMENT INTERCONNECTION	(AT 14M HEIGHT)	4.5" IPS AL. TUBE (120mm OD)/QUAD AAC BULL CONDUCTOR WITH 450MM SPACING	
5.	EARTHWIRE	(AT 45M HEIGHT)	7/3.66mm GI WIRE (10.98mm DIA)	
6.	INTERCONNECTION BETWEEN 765/400kV TRAFO TO 400kV SUB-STATION		QUAD BULL/BERSIMIS ACSR CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING/4.5" IPS AL. TUBE	
7.	EQUIPMENT INTERCONNECTON NEAR 765/400kV ICT AREA FOR HIGH BPI&HIGH LA	(AT 12M HEIGHT)	QUAD BULL/BERSIMIS ACSR CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING/4.5" IPS AL. TUBE	

CONDUCTOR & STRINGING DETAILS :-400kV

SL.NO.	DESCRIPTION	LEVEL FROM PLINTH	SUB-CONDUCTOR	TENSION INSULATOR STRING/PHASE
1.	MAIN BUS-I & II	(AT 15M HEIGHT)	QUAD AAC BULL CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	DOUBLE TENSION 120 kN DISC INSULATOR (2x25 Nos.)
2.	JACKBUS	(AT 22M HEIGHT)	QUAD BERSIMIS ACSR CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	DOUBLE TENSION 120 kN DISC INSULATOR (2x25 Nos.)
3.	DROPPERS/JUMPERING	--	QUAD BERSIMIS ACSR CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	SINGLE STRING-120kN DISC INSULATOR (1x25 Nos.)
4.	EQUIPMENT INTERCONNECTION	(AT 8M HEIGHT)	4.5" IPS AL. TUBE /QUAD ACSR BERSIMIS CONDUCTOR WITH 450MM SPACING	
5.	EARTHWIRE	(AT 29.5M HEIGHT)	7/3.66mm GI WIRE (10.98mm DIA)	
6.	BUS CVT, CVT & LA IN LINE BAYS	--	TWIN BERSIMIS ACSR CONDUCTOR WITH 450MM SUB-CONDUCTOR SPACING	

SYSTEM PARAMETERS (765kV):-

Sl.No.	DESCRIPTION OF PARAMETER	765kV SYSTEM	400kV SYSTEM	220kV SYSTEM	36kV SYSTEM
1	HIGHEST SYSTEM VOLTAGE	800kV	420kV	245kV	36kV
2	NORMAL SYSTEM VOLTAGE	765kV	400kV	220kV	33kV
3	RATED FREQUENCY	50Hz	50Hz	50 Hz	50Hz
4	NO. OF PHASES	3	3	3	3
5	RATED INSULATION LEVELS				
	i) FULL WAVE LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.)	±2100kV	±1550kV	±1050kV	±170kV
	ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec.) DRY & WET	±1550kV	±1050kV	--	--
	iii) ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE (rms)	830kV	630kV	460kV	70kV
6	CORONA EXTINCTION VOLTAGE	508kV	320kV	156 kV	--
7	MAX. RADIO INTERFERENCE VOLTAGE LEVEL AT 508kV (rms) FOR 765 kV & AT 320 kV (rms) FOR 400kV	2500 micro volts	1000 micro volts	1000 mV	--
8	RATED SHORT CIRCUIT CURRENT FOR 1 SEC. DURATION	50kA	63kA	40kA	25kA
9	SYSTEM NEUTRAL EARTHING	EFFECT. EARTHED	EFFECT. EARTHED	EFFECT. EARTHED	EFFECT. EARTHED

	Lattice Structure for Towers & Beams		
	Standard Structures for 765kV		
a	7CA column	Nos.	16
b	7BB	Nos.	16
c	7BA	Nos.	8
d	7CB column	Nos.	26
e	7BC	Nos.	13
f	7BD	Nos.	26
g	7GWCB	Nos.	26
h	7CC column	Nos.	8
i	7BE	Nos.	4
j	7BF	Nos.	8
k	7GWCC	Nos.	8

REV.	DATE	ALTERED / CHECKED / APPROVED	ZONE

ADDITIONAL INFORMATION
W.O.No. AA 11035 , PROJECT CODE – 384

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

NAME OF CUSTOMER: POWER GRID CORPORATION OF INDIA LTD

NAME OF PROJECT:
SS02 for Construction of 765/400/220kV Banaskantha S/S and Extension of 400kV Sankhari (GETCO) S/S with Green Energy Corridors : Inter-State Transmission Scheme (ISTS) – Part B
NOA NO.– CC-CS/483-WR2/SS-2803/11/G8/NOA-II/5507 & 5508 Dtd 01 Sep2015

BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	NAME	SIGN.	DATE
DRAWN	JK		21.03.16
CHECKED	SK		
APPROVED	RS		

DEPT. CODE | SCALE: NTS | CARD CODE

TITLE: LAYOUT PLAN FOR BANASKANTHA 765 KV/ 400 kV/ 220 KV SUBSTATION

DRAWING NO.: TB-384-510-002 | REV.: 02

SHEET No. 01 | NEXT SHEET –

PRINT SIZE A0